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Battelle
Memorial Institute

To prepare you for the challenge of the '80s, a major new educational program series in

Data Processing & Information Technology

"The explosive growth of computing power is changing the structure and economics of data processing so rapidly that most data processing knowledge acquired in the '70s cannot meet the demands of the '80s...." page 2

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New York Washington Chicago Boston
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Memorandum to: Data Processing Professionals

The explosive growth of computing power is changing the structure and economics of data processing so rapidly that most data processing knowledge acquired in the '70s cannot meet the demands of the '80s.

As a data processing professional you are acutely aware that coping with change in the information technology disciplines is a major challenge to you in the '80s. New issues confront you constantly. How you understand them and deal with them will have a measurable impact on your professional growth and the productivity of your organization.

For most data processing professionals, continuing education has become a built-in part of their lives. The educational programs detailed in this catalog are designed to reflect the changes taking place in the field and to be responsive to your specific needs.

In the technological environment of the '80s, we have identified the following issues as central to what is, and will be, taking place:

1. In a world of increasingly complex decision making, attention is focusing on management productivity. Computer-generated information is being used more and more for daily problem solving and decision making at operational levels.

2. Users of computer-generated information at all levels are becoming significantly more influential in determining how their information needs are fulfilled.

3. The ways in which information is packaged, delivered and used are changing dramatically.

4. While the cost of information processing continues to drop sharply, related personnel costs are going up and productivity is now a major concern.

5. Data processing managers are becoming information resource managers.

6. Data processing and communications technology are becoming more intertwined.

7. Hard questions are being asked about organizational structures, with pressures growing to redesign organizations to deal with the dual need for both centralization and decentralization of information management facilities.

To help you cope with the data processing challenge of the '80s, I urge you to examine this catalog and select the seminars that will directly benefit your career and your organization. The return on your investment in new knowledge can be substantial.

Cordially,

James M. McDonald, Jr.
Director, Battelle Seminars and Studies Program

The Seminars and Battelle's Commitment to Quality

Any successful educational program must be in tune with changes taking place in technology, the economy, and organizational needs. We have done extensive research and planning to assure you that the seminars are:

1. Timely. The subjects reflect today's needs of professionals in light of changes now taking place in the field and in the way organizations function.

2. Well-organized. We plan the seminars so that they communicate what you need to know in the time allotted.

3. Practical. The seminars are totally oriented to the individuals who wants to apply immediately the information acquired.

4. Aimed at professionals with common interests. The sharp focus of each seminar in this catalog tends to bring together attendees with common objectives.

5. Educationally sound. Our instructors are leaders in their subjects and are excellent communicators.

The small size of the seminar groups will give you ample opportunity to interact with instructors and other participants and to air your own problems and questions. The seminars thus maximize your learning experience.

These seminars are sponsored by the Battelle Seminars and Studies Program, a corporate educational services component of Battelle Memorial Institute, an independent nonprofit multinational organization devoted to the use of science and technology for the benefit of mankind. Battelle has a staff of some 7,000 scientists, engineers and support personnel at major research centers in Columbus, Ohio; Richland, Washington; Frankfurt, Germany; and other sites for specialized activities. From its income, Battelle supports a wide variety of charitable and educational programs.

Battelle scientists and engineers are at the forefront of computer technology, utilizing their expertise in a broad range of both hardware and software applications, including management information systems, computer graphics, modeling and analysis, data acquisition and process control, robotics, and distributed systems.

Battelle Columbus Laboratories (BCL) has developed ACTS, a powerful new software development tool that promises productivity increases far surpassing more conventional approaches. Designed specifically to monitor project development status and expedite creation of complex on-line transaction application systems using large integrated data bases, ACTS gives a project team control over its development activities never before attainable. ACTS has exceeded all expectations in the development of the Marine Safety Information System for the U.S. Coast Guard, and BCL plans to apply ACTS to banking, project management, and other on-line developments. BCL has also produced BASIS, a data management system designed to run on IBM, CDC, Univac and DEC mainframes. It has been installed on 60 computers at 31 sites. BCL's Intelligent Device and Microcomputer Systems group applies microcomputer technology in settings ranging from the space shuttle to industrial process control. The group issues the monthly Microcomputer Applications and Technology Center newsletter.

Battelle-Northwest (BNW) in Richland, Washington, has developed numerous specialized mini-computer and microcomputer-based data acquisition and control systems. A general-purpose data acquisition system has been developed to provide concurrent data analysis, data verification, color-graphic display and on-line video taping of test results. Project operating personnel given little training can operate the system. Key features include on-line user instructions, pseudosensors, historical display and users' specified reports. BNW is currently conducting research in statistics and computer science directed at developing and implementing methods to analyze large volumes of research data which will result in a more affordable computational resource for industry.

Strategic Planning for Management Information Systems

Program No. 100.01

Seminar Objectives—What You Will Learn

Many organizations are concerned about the impact that new data processing technologies and techniques may have on their present investment in computer equipment and people. Do you have a cogent EDP plan for the 1980 s? Are you certain that your planning is based on a clear understanding of information processing in the years ahead? Do you want to order a larger computer but are not certain if it is really necessary? Are you concerned that your data processing costs have been rising substantially each year for the past five years and do you wonder if there is an end in sight? Are there complaints about poor service delivered by your MIS group? Strategic planning deals with issues such as these. The need for effective strategic planning for the EDP function is of crucial importance to all levels of responsibility within the data processing activity—and many levels of management outside of it.

You will learn: How to develop strategies and prepare practical, workable, operations plans for effectively managing MIS resources—Planning principles and processes for developing sound plans—How to define significant issues that need to be resolved and how to specify your organization's current and future information processing needs—How to identify improvement opportunities and to develop means of capitalizing on them—Ways to design an overall strategy to attain certain goals and objectives—How to obtain management's support for the strategic plan, to develop operational plans to manage systems development projects, to ensure availability of equipment capacity when needed, to manage human resources effectively.

Program Description

1. An effective planning methodology.
Importance and objectives of planning, the risks and obstacles involved, overcoming planning deterrents, how to get started. The relationships among mission, goals, objectives and plans—and how they form the planning "pyramid." What are the six principles professionals use when developing practical, comprehensive plans? What are the different kinds of plans that can be developed, and the depth and breadth of planning for each kind? The 12 steps in the planning process and how to involve management. What are the different kinds of planning end products, how can they be integrated with other planning documents? What kinds of needs are involved in selling the plan to management?

2. What the strategic plans consist of.
How to define the key issues in developing an MIS strategic plan. Writing an accurate mission statement and forming realistic goals and objectives for your company's MIS function. How to crystallize users' information processing requirements, separating fact from fiction. Defining a superior information delivery service within a realistic budget. Planning for users' special and unpredictable information needs. The importance of developing "in principle" solutions: why and how professional problem solvers develop solutions "in principle," objectively evaluate and cost out alternatives, and select the most appropriate solution—testing for the presence of three characteristics: workability, timeliness and salability. Designing an overall strategy: the importance of documenting the plan's basic assumptions, developing a conceptual plan, even before all the facts have been gathered, and linking the strategy to the company's plan.

3. Operational plan No. 1—systems development projects.
Translating information needs into systems requirements. What are the planning considerations involved in purchasing prepackaged software vs. building your own systems. How you can make these plans believable. How you can accurately define and estimate the effort involved in systems development projects; how you can avoid overrunning the budget and schedule. How to prepare and use estimating standards. Setting priorities is crucial. Cost/benefit method for establishing priorities and gaining their acceptance by management and users. Preparing the actual plan: allocating resources, scheduling the projects, developing contingency plans.

4. Operational plan No. 2—equipment capacity.
Two planning approaches to deal with the seven deadly sins of equipment planning. How to forecast equipment expansion; translating systems requirements into equipment requirements, using the critical characteristics of equipment that affect performance—cycle time, number and size of channels, transfer speeds. How and why to use the experiences of others; pioneering is risky! Need for lead time and contingency planning in installing new equipment. Using performance tests before delivery, acceptance tests after delivery to avoid schedule delays. How to deal with vendors.

5. Operational plan No. 3—human resources.
How to estimate staffing needs. Inventorying needed skills, translating systems and equipment requirements into staffing needs. Three approaches to staff training: the related planning considerations. How to schedule individual workloads to avoid schedule overcommitments and conflicts.

6. Final steps—preparing, selling and monitoring the plan.
How to choose the right format for your plan. Tips for making it easy to read. Selling your plan to management—what the different kinds of benefits your plan can have, how they can be measured, ways to present them to management. How to monitor and update your plan. Use of "deliverables" and concrete events as progress review checkpoints. Manual and automated systems for monitoring performance and reporting progress. Developing productivity data and using them to improve estimating.

About the Seminar Leader

William O'Brien.
Founder and President of Information Processing Consultants, Inc.—Has been in data processing for 25 years—Specializes in the development of management information systems and management of the EDP function—As a Principal of Cresap, McCormick and Paget, Inc. (1963-1973), directed that firm's systems and data processing practice in eastern U.S., Canada and Mexico—Had been with IBM and Honeywell—Founding member of Institute of Management Consultants and a Certified Management Consultant (CMC)—Frequent lecturer and instructor—Has B.A. from Brown University.

Decision Support Systems

Program No. 100.02

Seminar Objectives—What You Will Learn

The "buzz word" of the '80's is "Decision Support Systems." A key issue for most organizations is management productivity —how to increase the return on large dollars invested in managerial and professional decision making. The ultimate objective of information systems must increasingly be to improve the effectiveness and productivity of key personnel—those whose daily decisions are based on rapid and convenient access to data on an organization's internal and external environments. The rapidly declining cost of computer hardware and the development of highly functional user-friendly software tools have provided the means to perform a broad variety of information management tasks. Directly related is work going on in the integration of office automation and data processing. Decision support systems are useful in such functions as: sales forecasting, budget and cash flow forecasting, capital allocation, market strategy development, acquisition analysis, new venture analysis. We particularly recommend this seminar for information systems management and systems analysts/designers who want to be leaders in what has become a vital area.

You will learn: How to determine the critical information requirements of your organization's decision makers—What resources you need to properly build decision support systems—How to design and implement several types of DSS—How to gain management confidence and support for providing a DSS environment—How to capitalize on user interest in this type of capability.

Program Description

1. The key role of decision support systems.
Movement of decision support systems from an academic discussion topic to a viable management support tool with genuine everyday utility. "Decision support systems" vs. "decision-making systems." Why the former is flourishing while the latter is not. What is the "systems pyramid" and where does DSS fit in the total scope of information management? How the degree of problem structure affects the usefulness of decision support. Determining DSS information requirements.

2. Types of decision support systems.
"Model-based DSS" and their use in business organizations: risk analysis, strategic planning, market forecasting, marketing planning, credit granting. "Data-based DSS" as an information resource. Flexible inquiry language applications: personnel and benefit planning, financial planning and analysis, foreign currency exposure analysis. Many more examples will give clear insight into differences and similarities.

3. Relationship of DSS to other information systems and data sources.
The relationships of some types of DSS to operational data processing systems. Other sources of data for DSS: public data bases (econometric data, legislative information, corporate performance), industry data. The tradeoff between direct access to operational data bases and the use of extracts. When and how to use both. Means of access to public data bases.

4. Tools for building DSS.
Software and hardware tools for DSS implementation: procedural and non-procedural languages, data base management systems, DSS generators, time sharing, graphics, micro computers, automated office equipment. Stand-alone solutions vs. interactive access to large mainframe computers. Relevance of tools to specific application types.

5. DSS development methodology.
The nature of the typical DSS and the distinction with traditional DP systems. Implications for the normal phased system development process. "Bread-boarding" and the concept of a "pilot" in DSS development. Adaptive "middle-out" design as opposed to "top-down" or "bottom-up."

6. DSS support environment.
Essentials of a DSS support environment. Finding and keeping the right kind of people. Hardware and software resources required. Putting the information systems organizations out in front in delivering practical decision support systems and gaining management confidence and support.

7. Productivity benefits.
Specific examples of managerial and professional productivity gains. Relationship of managerial productivity to clerical productivity. "Cost savings" vs. "cost avoidance" vs. "value-added." The bottom line impact of DSS.

8. Case studies/exercise.
Several case studies of successful decision support systems to demonstrate usefulness of the concept. Exercise for participants will define an approach to building a DSS for a particular management problem using tools and techniques developed in the seminar.

About the Seminar Leader

Mark I. Grossman.
Consultant in information systems, and financial and administrative management—Has been responsible for analysis design, implementation and support of computer-based information systems in finance, marketing, materials and operations —Directed design and implementation of an on-line multi-division receivable systems—Designed and implemented a model for analysis of capital investments under uncertainty—Developed various other models and decision support systems —At RCA Corp., has been Senior Operations Research Analyst, Manager of MIS Finance and Administration, Director of Financial Systems—Member: ACM, The Institute for Management Science, Society for Management Information Systems, Operations Research Society of America—Has B.S. in mathematics from MIT, M.S. in physics from Rutgers, M.S. in statistics from Rutgers.

Data Communications: An Intensive Introduction

Program No. 100.03

Seminar Objectives—What You Will Learn

No area of data processing is growing faster and in more directions than data communications. The range of facilities and services now available and those being planned is staggering. This has led to a very rapid growth in the use of data communications in all types and sizes of organizations—and has made an understanding of such concepts more important than ever. This seminar focuses on the principles of operation of basic data communications systems and networks, emphasizing the methods used rather than the technical details underlying these methods, providing an understanding of the practical uses of and design approaches to successful data communications systems.

You will learn: About the types of data communications facilities now available from telephone companies and other common carriers, and how to make a cost-effective choice—About the new procedures and protocols that are expanding the use of data communications into many different fields—Methods of putting networks together and the advantages of each method—How to use microwave, message switching, packet switching and satellite services—About data communications software—About system requirements and parameters—How to perform network testing and to fine-tune the network.

Program Description

1. Background/introduction.
The important differences between data communications and other aspects of data processing. Emphasis is placed upon the exploration of the complexities of data communications from the standpoint of management and control, caused in large part by the multiplicity of vendors and services that are usually involved in data communications installations, and by the variety of equipment, programming systems, and services available. Ways in which data communications is used and categories of data communications systems: information retrieval and updating, data entry and transaction processing systems, remote batch processing, time sharing, message and packet switching, production control. Concepts used in data communications networking and the equipment and programming components. Distributed processing and its impact.

2. Basic concepts.
Data representation: to be useful in data processing and data communications, information must be transformed into a form amenable to electronic handling—the bit, the character, and the message; information coding schemes, such as ASCII, EBCDIC, and why differences in codes are important, how they affect data communications, and why. Methods of transferring data, how data is changed, the impact of these transformations on the user of the system. Several methods of data transmission are explained, together with various types of circuits or communications links. Data communications protocols and their uses.

3. Network components.
Terminal equipment: teleprinters, display stations, cluster controllers, distributed processing systems and their variants, such as remote job entry systems or data entry systems, certain types of special-purpose transaction-oriented devices, such as point-of-sale and banking terminals, and data acquisition and control systems. Interfacing equipment, equipment used to interface terminals and other devices, such as communications controllers, to the communications links: modems, multiplexers, concentrators, packet-switching "gateways," and various kinds of port sharing and conversion equipment.

4. Communications service suppliers.
There is a bewildering range of communications service suppliers now available, presenting a bewildering range of different services: basic common carrier services and what you need to know to make a cost-effective choice. Satellite communications services and their advantages and problems for the network designer. Local networks for office technology installations, and their differences in technology from other types of communication services.

5. Data communications software: locations and functions.
The rapid increase in availability and use of programmable equipment, previously limited to a few components in a data communications network, has made software a major consideration in development and cost-effectiveness of networks. Generic categories of data communications software: where it is resident, what it does, who prepares it, who keeps it going, how it all works together, and some ground rules for choosing and operating it.

6. Putting it together: data communications systems design.
System requirements and parameters: data flow or traffic patterns, locations and generic types of terminal devices, types of transactions to be processed and their origins, types of system users. Network reliability considerations: the various ways of performing error detection and correction and how to go about assuring that the network's reliability, either in part or in whole, falls within the established limits. Principles of network architecture: several ways of putting a network together and some rules concerning the need for departure from the simple into the more complex network structures.

7. Keeping it together: administration and management.
A checklist for a set of overall network-oriented use and operating procedures that clearly establish and enforce rules for network maintenance and operation. What overall network standards should be—possible contents for a manual. Network monitoring and reporting: How well is it doing? How can we predict if and when things are going to be wrong? Is the user getting the expected response time or other service parameter? Hardware and software methods for gathering such information and also for fixing the network when things go wrong.

8. The future.
Some insights into developments now on the horizon of data communications but not yet a commercial reality—new interface standards, such as X.21, expanded and increasing use of satellites, the now withdrawn but still in the future ACS offering from the Bell System, and new trends in network design and implementation.

About the Seminar Leader

Henry C. Clark.
Consultant, with specialization in data communications, networking and distributed processing systems—Directed the evaluation, selection and contract negotiation for a major corporate installation of all data communications equipment—Developed conversion plans for a very large Department of Defense DP installation for going from second-generation equipment and software to up-to-date methodologies, including data base management systems and full-scale networking—Had been Manager, Data Communications Planning for Honeywell Information Systems; Division Chief, Computer Systems Development, Bureau of the Census; Director, Technical Services for Citibank's Transaction Technology, Inc.—Member, ACM, IEEE—B.S. from Columbia University.

Cost-Effective Software Development: The Life-Cycle Approach

Program No. 100.04

Seminar Objectives—What You Will Learn

Extensive research and much experience in software development have shown that not using a "life cycle" methodology can result in systems that do not meet user requirements, are over budget and cannot be adequately controlled. Software, as well as most other systems, must be developed in a series of discrete but interdependent steps. Ten different life cycles will be studied, the use of which will yield nine major benefits. We recommend this program particularly for the data processing professional who is responsible for developing software and for training or managing people who develop software.

You will learn: The development and implementation of a strategic and/or tactical plan for establishing or restructuring the software development activity—Selection of the mix of tools and techniques that are most appropriate for: (1) decreasing the time required to develop software; (2) increasing the modifiability, maintainability and adaptability of software; (3) the development of correct and usable systems; (4) decreasing the cost of software development; (5) increasing the productivity of and return on investment on computer resources—Techniques for evaluating the quality and effectiveness of software.

Program Description

1. Definition and role of life-cycles.
Why the life-cycle concept is important in the development of both natural and artificial systems—and the relationship to data processing. Why the concept is used. What are the ten software-related life cycles? How these life-cycles relate to each other: areas of mutual interaction and dependency.

2. Benefits from using the life-cycle approach.
How the life-cycle approach can increase your cost benefits and return on investment, and reduce your risk. Four areas for significantly improving the quality of systems: the modifiability, adaptability, maintainability and correctness of the system.

3. Details of ten life-cycles.
What activities are involved and the how-to methodologies for ten life-cycles: system development, data base, operations, quality engineering, personnel, hardware, control, audit, planning, and use. Analysis of overall structure of each life-cycle to illustrate how activities within a life-cycle interact. Benefits and exposures associated with each life-cycle.

4. Systems development life-cycle.
How to integrate ten life-cycles into one general, overall System Development Life-Cycle (SDLC). Major interactions between life-cycles, including: need for use of advanced programming methodologies, and the control concerns that arise from using data base technology and the changes in system development necessitated by data base technology. Impact of SDLC on: system cost, development time, quality, usefulness, and monitoring, controlling and managing systems development. Five automated tools to support the SDLC: data dictionary directory systems, problem statement languages, code generators, on-line editors and test generators.

5. Planning for future actions.
How to use strategic and tactical planning for the SDLC. Three major methods for EDP planning. How to integrate EDP plan with corporate business plan, risk plan, recovery plan. What the need is for standards, procedures and guidelines, evaluation criteria and mechanisms for introducing modifications in a changing environment.

6. Future trends.
Major new and innovative trends in five areas: software engineering, automated control tools, software generators, hardware, quality engineering.

About the Seminar Leader

Philip H. Teplitzky.
Principal in data processing consulting firm, The Plagman Group—Specialist in application of software engineering principles to data base design, application system design, quality engineering, data base audits, development of data base controls—Has been researcher for joint AICPA, CICA, IIA Research Project on Audit of Data Bases—Was senior consultant with DBD Systems Inc; management consultant with Peat Marwick Mitchell & Co., as member of software engineering group of the advanced technology practice—Has frequently lectured and written monographs on various software and data base topics—Member of ACM, IEEE—B.A. from Harpur College, M.S. in computer systems from the School of Advanced Technology, State University of New York at Binghamton.

Battelle Data Processing Seminars have been attended by representatives of:

Arthur Andersen and Co.
Applied Physics Laboratory
Battelle
Baylor College of Medicine
Berg Electronics
Boeing Computer Services
City of Seattle
Connecticut Bank & Trust Co.
Consolidated Computer Center
Consumer Systems
Continental Group
Control Data Corporation
CX Corporation
Cray Research Incorporated
Davis, Wright, Todd, Riese & Jones, Attorneys
Deloitte Haskins & Sells
DeMoulas Supermarkets, Inc.
Department of Social and Health Services, Washington State
Derrick Service International
Ealing Corporation
EG&G Idaho
Emery Air Freight
E Systems, Inc.
Family Life Insurance
F.W. Faxon Company
Federal Land Bank of St. Paul
John Fluke Manufacturing Co.
General Electric Credit Corp.
Getty Oil Co.
GTE Communications Network Systems
GTE Sylvania
Honeywell
IBM
I-Tron, Inc.
Land O'Lakes
Lemsco
Magnetic Periferal Inc.
Manufacturing Technologies
Midwest Comsy Field Office
Milwaukee County/Systems Development
The Mitre Corporation
Mobil E&P Services
MSI Insurance Companies
Nalley's Fine Foods
Naval Underwater Systems Center
NBS Programming
Nike
Northwest Computer Services
Northwestern National Insurance Co.
Oregon State University Computer Center
Oregon Typewriter & Recorder
Philadelphia Life Insurance Co.
Poorman-Douglas
Rainier National Bank
Rockwell Hanford Operation
Sanpad Industries, Inc.
St. Lukes Hospital
Seattle Times
Singer Co.
Secretary of State, Division of Audits, Oregon
Shell Development Co.
Sperry Univac
Stayton Telephone Company
Stone and Webster Engineering
Super Valu Stores, Inc.
Tacoma Boatbuilding
Tektronix, Inc.
University of Houston
University of Notre Dame
University of Washington
U.S. Department of Interior
U.S. Naval Undersea Warfare Engineering Station
Utility Vault Co.
Weyerhaeuser
Wheeler Electronics
Xerox Corporation

Distributed Data Processing: Application of Minis and Micros

Program No. 100-05

Seminar Objectives—What You Will Learn

Distributed data processing systems are rapidly expanding in numbers, and in the impact on businesses that employ them. There is an increasing user demand for processing power—for greater proximity, for greater control over scheduling, for greater control over costs, for greater flexibility. But there can be negatives: high cost of system and network development, need for effective end user education, difficulties of network maintenance and management. In the absence of sound knowledge and experience, the benefits that distributed systems promise can be lost. This seminar covers the key aspects of DDP: technology, problems and opportunities.

You will learn: Why distributed processing is encouraged by the very data processing people who oppose it—What DDP offers to the corporation and its user managers—How to avoid the problems that are usually associated with distributed processing—How the headquarters computer people can avoid losing control of data processing, while benefiting from DDP—How the hardware elements of a minicomputer system differ from those of a mainframe—How to select components that meet present and future requirements—What the essential elements of minicomputer software are, and how to evaluate them—An overview of data communications as the link between distributed systems—When to apply the system life cycle approach to new applications—How to size an application—Why many implementations fail, and how to be sure yours won't—Which vendor to choose, and how to manage the relationship—The elements of successful negotiation with hardware and software vendors.

Program Description

1. DDP concepts and definitions.
The negatives of central computer performance that spur an interest in distributed data processing: lengthy turnaround time, inflexibility for changing programs, too-high charges, user frustration. Benefits of DDP: lower costs, greater impact on ROI, offloading of the mainframe, greater ability to capitalize on advances in technology. Benefits and pitfalls: how to gain one and avoid the other.

2. Hardware elements: the tangible foundations of DDP.
Minicomputers and microprocessors as the principal ingredients of DDP. Capabilities and characteristics of central processing units. Primary memory—its significance in cost, size, speed and accuracy. Secondary storage: types, capacities, costs and constraints. CRT workstations—the man/machine interface. Printers—matrix, impact and others—a comparative analysis that assures the right printer for each application.

3. Software elements: intangible but all-important.
The operating system as the real brains behind the computers. Utilities—wheels that need not be reinvented. Productivity aids for efficient programming. Data base management ensures effective handling of a company's most important asset. Programming languages—a survey of those commonly used with small computers. Applications programs get the job done. Software packages as an alternative to custom programming—with a check list to assure successful acquisition and implementation.

4. Data communications: getting it all together.
Network configurations to suit the needs. How to choose from available media. Understanding protocols. On-line and batch communications. Using front-end systems to relieve the CPU burden. Concentrators and multiplexers. Modems and modulation methods. How to use data communications to assure the success of a distributed processing network.

5. The system life-cycle: ignore it at your peril.
Feasibility study, functional specifications, preliminary design, systems design, programming specification, development and implementation—why they are all necessary to avoid failure. How to select an application for distributed processing. How to determine the application's requirements. How to ensure that file sizes, response time and throughput will be adequate for present and future needs.

6. Selecting and managing vendors: a guide for the vulnerable.
Which comes first—the hardware or the software. *Caveat emptor*—let the buyer beware. How to evaluate vendors and their offerings—pros and cons of decision matrices. Consultants, software houses and turnkey systems integrators can help or hinder, depending on how you handle them. Maintenance of hardware and software as a critical element in selection and operation. Contract negotiation principles.

7. Systems implementation: making it work.
Acceptance testing as a go/no-go signal. Operator and user training methods. The conversion process—what it entails and why it often fails. Parallel operation as a costly but necessary prerequisite to "going live." The post-implementation audit measures the degree to which objectives were achieved, and points the way to further improvements.

8. What the future holds.
Word processing, electronic mail, computer conferencing, home interconnections to business computers; all will become widespread in the immediate future. Rapid technological developments in VSLI, cryogenics, fibre optics and satellite communications will speed these advances and encourage others as yet unseen. Future directions and their impact on personal and business lives will be discussed.

9. Security and controls: DDP's Achilles' heel.
Why DDP is more susceptible to fraud and error than centralized systems. Data communications provide entry for the unwanted. Unrestricted machine access, and ease of use also encourage tampering. Encryption and scrambling as preventive measures. Backup and recovery. Enlisting the auditor's aid.

About the Seminar Leader

Seymour Bosworth.
In data processing for more than 30 years—For the past ten years, has concentrated on uses of minicomputers in business and banking—Experience includes virtually all areas of data processing, from design and manufacture of computers through systems analysis and programming, to operation of large and small computer systems, both centralized and decentralized—Currently, Vice President, Bankers Trust Company of New York—Was President of a service bureau and computer manufacturer—Adjunct Associate Professor of Management, New York University—Frequent lecturer and author, inventor—M.S. in business, Columbia University.

Data Base Systems: Management, Administration and Control

Program No. 100.05

Seminar Objectives—What You Will Learn

The development of an information-oriented business environment plus the availability of a multitude of software packages makes essential the need for an understanding of data base concepts. If you are responsible for the *management* and *control* of data resources and for adapting these resources to the needs of your organization, this seminar will familiarize you with the available data base systems and how to organize your department.

You will learn: How current data processing problems relate to data base management—What the objectives are of a data base management system—The terminology of data base systems, the functions of data base administration, the weaknesses of data base systems—How to evaluate alternative data base systems—How to structure a data base using the hierarchical, network, and relational models.

Program Description

1. Role of stored data in EDP systems.
Basic concept: You are shown how stored data, data management, data bases, and the end user are all important concepts which affect how a DP department designs its systems. Evolution: stored data evolution is traced through the master file, the data set, and the data base phases. Each phase is designed to accomplish similar results with increasing formalization and effectiveness. On-line data bases: consideration is given to how both management control and increased clerical productivity benefit from on-line data access.

2. The system design process and data base management.
Goals and objectives: Consideration is given to the system design process starting with defining the goals of the system and moving on to the kinds of information requests that it will support. Data base design: design concepts are reviewed which assure the data base will support the goals and objectives of the system.

3. Modern data base systems.
ANSI 3-level schema: The proposed ANSI standard is discussed. This standard will organize the data in the data base into three levels: multiple user views of the data, the logical definition of data entities and their relationships, and the method of storing the data for efficiency. Logical data definitions and the "data models": hierarchical, network, relational, inverted. Data dictionary: you are shown how the data dictionary provides the resource in which the definitions of the real data base are stored and utilized.

4. Data base administration.
The role of the data base administrator or DBA group is defined. DBA personnel requirements are reviewed. DBA organizational role. The organizational relationships: steering committees, planning committees, data administration, and procedures for charge-back of services.

5. DBMS software systems.
Features: data definition, application programming language, query processor, integrity, consistency, security, recovery, and performance. DBMS software offerings. DMS 1100, System 2000, Total, IMS, ADABAS, DMS 11, and others. Evaluation criteria for DBMS software.

6. Data base management—how to plan and implement a project.
Goals and objectives, personnel selection and training, education of user departments and management, use of steering committees, phasing software selection and procurement, implementation of the system, recovery procedures, and performance monitoring.

About the Seminar Leader

Ronald B. Batman.
Has been in data processing for 24 years, involved with data base management systems for 17 years—Manager, System Design for New Products, Sperry Univac—Has been involved creatively or as management in most of Univac's DB/DC software—Has been project manager or consultant to many well known companies—Has lectured extensively and was Manager, Univac Systems Graduate School.

Battelle Summer Institutes

Please see page 14 for information on the *Battelle Data Processing Summer Institutes.*

Data Base Systems: Introduction to Technology and Design

Program No. 100.07

Seminar Objectives—What You Will Learn

The effective use of technology in adapting the data resources to the needs of the organization is a problem faced by data base administrators, systems programmers, data processing managers and planners. For those managers who have the need for a comprehensive understanding of the *technology* and *system design* of data bases, this seminar is designed to provide you with an analysis of data structures, access methods, the computer and the data available so that all components are responsive to the data base management system.

You will learn: An overview of the five most popular DBMS systems: ADABAS, IDMS, IMS, System 2000, and TOTAL—Gain the ability to assess which computer applications should or should not use a DBMS—Learn how to go about selecting a corporate DBMS—Learn the importance of planning for data integrity and security—Be made aware of future trends in the computer field and their implications for long range DBMS plans—Learn how to estimate the performance of DBMS for proposed applications.

Program Description

1. Definitions.
Stored data vs input/output data, files and data bases, data management.

2. How to establish files and data bases.
Evolution of EDP systems, on-line data, materials available for better control, examining on-line data bases as the most critical factor in application design and EDP operations.

3. The system design process.
System design and user goals. Results, reports interactive transactions, and queries. Designing the data base to support the application. Limitations of scope and responsiveness. Trading off space vs time and retrieval vs update.

4. Overview of modern data base technology.
Devices available for future developments. Control unit functions. Role of channels. Data management software. Data base computers.

5. Data base management system software.
ANSI 3-level schema. Logical data models: hierarchical, network, relational.

6. DBMS functions.
Data definition. Application of data manipulation language. Integrity of data. Consistency and sharing among multiple users. Security and access control. Recovery and back-up.

7. Performance considerations.
What are the components of performance device, channel, storage structure, access paths. Evaluating queuing considerations. Examining the various instrumentation techniques.

8. Operational aspects of data management.
Configuration estimates. Back-up and recovery procedures. Physical security.

9. Pitfalls in data base design.
Logical redefinition of data. Skewed data activity. Over-integration. Recovery problems. Operational problems.

10. Storage methodologies.
Inverted list. Imbedded pointer. Relational.

11. Basic functions within a DBMS.
Physical I/O BDAM SIO, CCW. Buffer management. Record placement. Indexing or pointer handling. Schema and subschema generation and handling. Communicating with the user. Report generator/inquiry. Utility routines. Data compression. Multiple user-communications interface. Debugging facilities. Overlays/paging considerations. Data base recovery. Password protection.

About the Seminar Leader

Joseph S. Rubenfeld.
Over 14 years experience in programming and systems analysis with a wide variety of computers and application areas—Has demonstrated an exceptional ability to solve complex technical problems, often through new and innovative techniques—Presently at National Broadcasting Company in New York—B.S. in Electrical Engineering from Carnegie-Mellon University; M.S. in Computer Science from University of Pittsburgh—Member of ACM—Holds a CDP.

Other Battelle Data Processing Seminars

In addition to the seminars detailed in this catalog, the following four programs are being offered. For details, please write to the Registrar, Battelle Seminars and Studies Program, 4000 N.E. 41st Street, P.O. Box C-5395, Seattle, Washington 98105. *Mention the seminar number shown below.*

Computer Micrographics Interface (No. 100.15)

Deals with the latest developments in computer output microfilm, computer input microfilm and computer assisted retrieval.

Software Engineering (No. 100.16)

Designed as an overview for systems analysts, designers, programmers and managers, this concentrated seminar examines the state-of-the-art in software engineering.

Effective Writing Skills (No. 100.17)

A course for computer professionals. A comprehensive "how-to" seminar for all data processing personnel responsible for writing data processing documents.

Introduction to Teleprocessing (No. 100.18)

A comprehensive review of teleprocessing systems for all those who are required to understand how communications work, the available hardware and software alternatives, and who may be involved in the design of a system that uses data communication.

Systems Development Project Management

Program No. 100.08

Seminar Objectives—What You Will Learn

Managing systems development projects is still somewhat of a "black art." The project manager's task is notoriously difficult and is often undertaken at high risk to his or her career. Even in the 1980's, target dates and budgets are more often breached than observed. And recent surveys indicate that overall user satisfaction with delivered systems is lower than ever. EDP activities are evolving from hardware-intensive to software-intensive, which means heavily people-intensive. Major systems users nationwide typically have application development backlogs of two years or more. Motivating and retaining systems professionals has also become critical. This seminar addresses the problem of how to manage systems development projects successfully. It is a practical and incisive course that will provide tried and tested techniques that you can apply to your projects immediately and see results. The emphasis is on practice rather than theory and in dealing with both the daily and longer-term real world problems of managing systems development.

You will learn: How to get systems up and running that perform effectively to users' needs and are delivered in a timely and cost effective manner—What differentiates systems project managers who succeed from those who will fail—The eight key challenges in developing systems—How to most effectively utilize "building-block" approaches to building systems—A step-by-step planning process to estimate resources more accurately and produce high quality plans—How to best monitor programs and assure the quality of deliverables—Insights into which project control style may serve you best.

Program Description

1. Basic definitions and concepts.
The special nature of systems development projects. Roles and responsibilities of the EDP project manager. The eight key challenges of systems development today: meeting the real business needs; delivering systems on-time and within budget; delivering reliable software; hiring, retaining and motivating EDP professionals; building management commitment and user rapport; improving programmer and analyst productivity; maintaining current systems and ensuring orderly transitions; handling risk and uncertainty. Key factors present in successful systems projects. The ways systems project managers most often fail.

2. The "building block" approach to developing systems.
Managing phased systems development methodologies; decreasing risk through a "creeping commitment"; characteristics, end deliverables and types of people involved in each phase of development; major project milestones/checkpoints. The involvement of users and management in systems development.

3. Planning for systems development.
The first question: Are you planning to do the right things and for the right client? Time horizons and levels of detail in EDP project planning. Steps in the effective planning process: documenting and validating assumptions; top-down definition of detailed tasks and deliverables; breaking down tasks to the lowest level of control—the "80 hour" rule; identifying task dependencies and PERT charting; identifying resource and skill level requirements; allocating resources and trading of alternatives; scheduling and budgeting; presenting and validating the plan; "back-up" planning for contingencies. Resource estimating: getting away from "make a guess and multiply by 2"; major estimating techniques; where and how to use them; how well they work; evaluating individuals' skill levels and productivity; estimating rules-of-thumb for each specific phase of systems development; building your own historical productivity data for next time.

4. Controlling systems projects.
How to track progress most effectively: keeping on track with minimal paperwork; channels for obtaining feedback and receiving early warning of potential problems; avoiding the "90% complete" syndrome; reacting to deviations from plan; reassessing risk on an ongoing basis; what to do when you're in trouble. Assuring the quality of deliverables.

5. Managing systems professionals.
Functional, matrix and full project organizations. Their pros, cons and applicability to systems development. Handling multiple and dotted-line reporting relationships as a systems manager. Gaining top management commitment; successfully communicating upwards; lobbying for support and resources; moving your project from "working intent" to solid commitment; Selecting the best people for your project; what to look for; tradeoffs among strengths, weaknesses and fit.

6. Systems project management in the 80's.
Overview of evolving new systems development and project management tools. Managing the use of the new techniques: structured analysis and design; structured programming; data base design and implementation; managerial and technical implications of distributed data processing. Improving programmer productivity with new hardware and software tools. Dedicated test computers, higher level languages; application generators. A survey of automated project management systems: what's available; what each product can and cannot do for you.

7. Managing systems professionals.
What makes systems people tick? Software psychology: personality profiles of programmers, systems analysts and user groups; prime motivators and demotivators of systems people, proven methods of reducing turnover and keeping valued people; building the team spirit of EDPers; motivating people who work on systems maintenance.

8. Controlling systems projects
Meeting crash deadlines without losing control. How a project can be crashed; violating Brook's Law of late software projects; tradeoffs and costs of operating in a crisis environment. Where systems projects are most likely to go out of control. Using structured walkthroughs to develop reliable analyses, design and software, setting standards for deliverables, measuring adherence to standards; preparing for project checkpoints.

Ross T. Collard.
President of Collard & Co., a consulting firm specializing in information resources and systems management—Managed a 50-person project team for two years in developing health information systems on a large microcomputer network—Managed the automation of an on-line credit authorization system for a major bank—In addition to project management, has been involved in systems planning, EDP organization development, data base development, data communications design, computer evaluation and selection—Had been a senior consultant with Booz Allen & Hamilton, Inc., and Touche Ross & Co.—M.S. in Computer Science from California Institute of Technology, M.B.A. from Stanford—Holds a CDP.

Successful Management of EDP Operations

Program No. 100.09

Seminar Objectives—What You Will Learn

Data processing operations account for a significant share of total expenditures of most organizations. As a result, management is deeply concerned that EDP operations be effectively managed; that work be produced on time, accurately and within budget. Based on many years of practical experience, this seminar covers data processing operations and the latest thinking regarding performance analysis, capacity planning, overall planning and scheduling, disaster recovery and career pathing within the computer environment. You will be exposed to a practical approach to real-life situations, drawing on management techniques that encourage effective computer operations.

You will learn: How to set cost/performance standards and meet your budget commitments—How to maintain a reliable operation in an interactive environment with multiple users—To set priorities for applications and effective operating standards—Use of software and hardware monitors—Criteria for selecting between competing hardware and software vendors—To make more efficient use of the hardware and software you already have—To determine the relationship between forecasting, planning and scheduling—Whether you will have sufficient computer power one, two or three years from now—How to evaluate automated scheduling software and to select the most appropriate for you—How to propose and evaluate alternative disaster recovery plans for your site—To determine typical installation bottlenecks.

Program Description

1. Introduction: the role of EDP operations.
Four commandments to enhance credibility of EDP to top management. The responsibilities of EDP to the overall organization. Concerns of corporate management. Why EDP often fails to gain top management's understanding or support. The factory analogy.

2. Responsive EDP operations: defining objectives.
Three effective techniques for meeting goals. Identifying and reporting results to management. Establishing key objectives: cost/benefit ratios, cost effectiveness, ROI, productivity and service levels. How to determine user requirements and define acceptable performance in terms of cost, availability, response time, turnaround time, downtime, and adherence to deadlines. Qualitative factors in user satisfaction, and how to quantify them.

3. Efficient work flow processing.
The newest approaches to efficient production. Automated scheduling techniques. Methods for optimum utilization of equipment and personnel. How to increase productivity. Controlling tape and disk libraries to eliminate bottlenecks. Managing the input/output window.

4. Computer performance evaluation.
New ideas in how to develop data center standards that are acceptable and provide cost-effective use of resources. How to measure performance against standards. How to select and use hardware and software monitors. How to tune applications and operating systems to increase capacity. How to establish warning thresholds and how to ensure corrective action.

5. The expandable computer operation—capacity planning.
The new prophets in EDP—capacity planners. What is capacity planning, its relationship to performance evaluation. Why a plan is necessary. Determining practical levels of equipment usage. Gathering and interpreting utilization statistics. Analyzing the equipment configuration for suitability to increased volumes and planned growth. Setting objectives and designing a long range plan to meet the organization's needs.

6. The auditable computer operation—security and control.
The auditor's hottest item—disaster recovery. Accountability and culpability. Cost justification. Risk analysis. Insurance coverage. Machine room access. Data security. Encryption. Anticipating the audit. Documentation, the necessary evil.

7. The profitable computer operation—financial concerns.
Buy, lease or rent. Cost measurement and cost control. Financial reporting. Budgeting and planning. Job costing. Machine resource accounting. Charging for computer services—advantages and disadvantages. Chargeout algorithms gaining user acceptance.

8. The well-staffed EDP operation—human resources.
Effective personnel management. How to motivate people. How to get the job done. Incentives and disincentives. Reducing turnover. The effect of consultants on employees. What factors are more important than salary. The systems approach to training and career pathing.

9. The dynamic EDP operation—coping with change.
New directions in EDP present challenges and opportunities to the DP manager: distributed processing, expanding communications, plug compatibles, packaged software, third-party maintenance, unionization, the next generation of computers, word processing, electronic mail.

10. The successful EDP operation—and the successful manager.
How to reach the promised land and be sure that your operation will succeed. How to be certain that its success will be visible throughout the organization and especially to top management. How to guarantee that your contribution will be recognized and rewarded.

About the Seminar Leader

Louis Greenspan.
Data processing executive, with 25 years experience in computer operations, systems analysis and design, and programming—Currently, Vice President, Bankers Trust Company of New York—Had been Senior Vice President, First National State Bank of New Jersey; Manager, Systems, Programming Operations, Perkin-Elmer Corp.; Manager, Advanced Systems Development, J.C. Penney Co.—Had also been with Honeywell, IBM and Univac—Adjunct Assistant Professor at New York University and Pace University—B.B.A. in accounting from City College of New York.

Audit and Control: A Vital DP Function

Program No. 100.10

Seminar Objectives—What You Will Learn:

The explosive growth and all-pervasiveness of data processing are exposing the inadequate controls that many managements have over the DP operation. It is said that the cost of computer crime has reached the multi-billon dollar level. The increasing use of distributed processing makes systems more vulnerable to fraud and error. There are weaknesses in management and control of programming, including inadequate monitoring of changes in programs. Documentation is frequently not kept current. Data processing activities must be auditable. This seminar will lay out clearly for you the facets of the DP operation that need to be audited and the procedures for achieving an effective audit program.

You will learn: How to establish hardware and software performance goals—How to measure and monitor performance errors and reliability—About five packages that are available for measuring computer and staff performance—Why communications facilities are the weakest links in EDP auditing and what you can do about it—Which packages are effective for controlling schedules and equipment utilization—Alternatives for dealing with total catastrophe—The ways in which fraud and embezzlement can take place—How to detect and protect against fraud.

Program Description

1. Setting up an audit program: goals and responsiblities.
Ten reasons for having an audit program. Roles of EDP personnel, auditors and corporate management. Why personnel assignments and procedural documentation must adhere to corporate policies and goals. Operations and programs must meet established guidelines and performance standards. How to train staff in proper maintenance of company records. Need for privacy capability of equipment and for encryption.

2. Standards as audit tools.
How to make systems description, narratives and flow charts adhere to company-approved format or to national standards. Meeting systems plus security objectives for each application—and for all programs, documentation and changes.

3. Operations controls.
The kind of organizational structure and project management that are needed. Procedure for establishing controls, for project implementation and for performance post audit. How to protect documentation and tape/disk libraries.

4. Hardware and software audit controls.
How to establish performance goals: for system redundancy, for tracking errors, for system or operational reliability, for speedy correction of inaccuracies and invalid statements. Five examples of packages for measuring computer and staff performance. The need for controls on executive software; measuring performance and accuracy of standards for grading applications software. Three case histories, with solutions, of major problems in the weakest link in EDP auditing: communications facilities. Program application and hardware maintenance is a major task—two cases of maintenance-embezzlement of computer time. How to set up survival alternatives in the event of major catastrophe.

5. Operations controls.
Four packages that control schedules and equipment utilization. The extreme importance of identifying reasons for "reruns"—pinpointing errors in systems, programming and hardware. Controlling file and terminal use for quality control—studying outages, utilization schedules and equipment workloads. How to handle errors and emergencies.

6. Fraud and embezzlement.
Five categories of fraud and embezzlement: delusion input, operation interference, output alteration, manipulation programming, deceptive master file transactions. Five areas of vulnerability: receipts, payments, sales, inventory, purchases. Detection means; insurance liabilities (insurance companies that do risk studies); deterrents.

7. Fraud prevention responsibilities.
Four areas of concern: analysis of assets; regular, ongoing checks of system reliability; constant surveillance tests; use of available program packages to measure employee/equipment effectiveness.

8. Function of system controls.
Logical, technical, preventive and investigative controls: several cases. Input, processing and output controls. How to identify weaknesses in controls and how to use strengths.

9. System control and design problems.
Procedures for software testing and certification. Use of standards in all software debugging routines. Measurement of failure rate of each software debug routine.

10. Fraud prevention.
Auditing concepts: around and through the computer. Eight court cases re: design responsibility and audit trails. Why auditability must be part of design of systems for payroll, invoice and order entry, inventory and accounts payable. How programs can be used to audit edit program functions, test program construction and use, operations simulation. Why transaction usage monitoring is important—use of sampling techniques and performance measurement tools. Examples of proper and improper documentation, and of record protection controls.

About the Seminar Leader

Irving I. Solomon.
President of the consulting firm, Aris Associates, Inc.—More than 25 years of teaching experience and consulting in the business management, computer applications, accounting, programming and related data processing fields — For a five-state network of 65 savings banks, was responsible for creating the data processing system—Had been a market research engineer with IBM—Was Vice President, Information Systems, National Retail Merchants Association—author of many books, including, *Management Uses of the Computer, Automatic Handbook of Data Processing*—Member of ACM, National Standards Institute, EDP Auditors Association—Degree in electrical engineering from Georgetown University, M.B.A. in accounting from New York University.

Estimating and Managing EDP Costs

Program No. 100.11

Seminar Objectives—What You Will Learn

As data processing activities proliferate, there is increasing sensitivity at all levels of management about how cost-effective the DP activity is. Users, as they have become more knowledgeable about data processing, are much more demanding of the DP department in terms of the service delivered and the cost of that service. The successful DP manager is one who is able to be fully responsive and reliable in estimating or forecasting costs for individual projects and for the department as a whole—and to manage costs that are budgeted. Expense forecasting and management is tricky and complex. This seminar deals with the many variables involved.

You will learn: How cost analysis can be applied to computer operations in two distinct ways—How you can quantify the time of people and hardware—What unit cost, standard cost and actual cost are and how to determine them—How to forecast costs in detail—How to create a budget that includes the vital statistic, "value of production"—How to do a cost-benefit analysis—How cost analysis is used as a management tool, as a planning tool and as an organization tool.

Program Description

1. Defining cost.
Unit cost, as a factor in projecting pro forma operations for start-up or expansion analysis. Standard cost, for use in cost/benefit analysis, as well as user charges, cost estimates and efficiency tracking. Actual cost: identifying the actual expenditures incurred in providing resource or product to end users. Allocatable, or fixed cost, where additional user demands can be met with no immediate impact on operating budgets. Incremental, or variable cost, where additional service or product output has immediate impact on operating budget.

2. Management information aspects of cost analysis.
Labor distribution, to monitor operating efficiency. Hardware utilization, to improve production flow and product cost. Other cost elements: re-run analysis, level of service, quantitative aspects of product. Overhead: the policy, planning and procedures function. Indirect costs for general supervision of work flow. Direct costs: the "hands-on" doing of the job.

3. Cost as resource consumption.
In data processing operations, "resource" is *time* of people and equipment. How to quantify resources in dollars and cents. Cost of resources expended, by operation or service. Cost of resources expended, by job or application. Cost of resources expended, by user: expressed in terms that support the charges.

4. What DP budgeting is all about.
Operating line items for budget analysis and control. Budgets as an MIS tool for production efficiency monitoring. Operating pro formas—use in projections and capacity planning for both staff and equipment. Planning and projection of continuing user demand levels. Actual vs. budget comparisons for performance measurements. Impact of unanticipated user demand on budgets.

5. How to carry out cost/benefit analyses.
Estimating project cost for both developmental work and subsequent operations. How to set go/no-go decision points. Actual vs. estimate followup and post-implementation reviews. User/programmer/operations contributions to overall systems design—problem definition and programming. Credible and verifiable cost figures to support proposals, recommendations, requests and reports to upper management.

6. Cost as a management tool.
Using identified costs of operations to track and monitor production efficiency and improvements. Measure operating and planning improvements in dollars and cents terms. Dollar impact of problems as a means of focusing and directing management activity and problem analysis. Actual costs motivate, provide incentives re user demand, upper management decisions. Credible and supportable cost data to provide basis for operations audits. Costs provide weighted factors for planning purposes. Quantified production levels in dollars: the common denominator understood by all parties. Projecting increased requirements in both staff and equipment, reducing such requirements to budget line items. Relating demand/cost ratios to overall organizational development. Planning follow-up and post-implementation reviews for any approved requests, proposals or cost/benefit analyses.

7. Cost relationships.
Management objectives related to available resources or planned additional resource requests, in dollars and cents terms. Product quality and the trade-off between quality levels and costs. Levels of support in peripheral service areas and the tradeoffs between such levels and related costs. User demand and the impact of such demand on the operating budget and resource utilization.

8. The cost-effective operation.
Making and measuring continuing improvement in user service and product levels. Increasing levels of support without commensurate increase in operating costs. Identifying lowering unit cost as the effect of improved efficiency and increased production levels. Providing the correct options with the associated cost impact for the management decision making process. Directing resource allocation for maximum cost-effectiveness in service and product output.

9. MIS for EDP operation.
Applying computer technology internally to management of EDP operations itself. Analysis of application cost trends. Reruns, and the associated cost of reruns, to provide the basis for problem analysis and support. Management actions for reducing such activities. Establishing, demonstrating, enhancing and protecting the credibility of EDP operations through the use of verifiable cost data in communicating with upper management and the general user community.

About the Seminar Leader

Leonard Palmer.
Over 30 years of experience in data processing—Is an independent consultant specializing in EDP and computer operations management—Lectures widely and has an international reputation as a seminar leader—Has been operations manager of the State of California ADP Center—Has been with Sperry Rand and the Burroughs Corporation—Was a co-founder and President of Computer Service Centers, Inc. The company set up 12 operating subsidiaries, a leasing company, a finance company and a software development partnership.

Computer Hardware for Software Engineers

Program No. 100.12

Seminar Objectives—What You Will Learn

There are times when a software engineer must know about computer hardware in some detail. Often when a new hardware/software system is being constructed, software engineers must interface with hardware engineers. The software engineers might find themselves at a technical disadvantage when trying to communicate with their hardware counterparts. In companies where there are no hardware experts, software engineers often find themselves being asked about prospective hardware purchases. Probably the most common example is the greater use of microcomputers and microprocessors, either by themselves or embedded in other technology. It seems that the smaller the system, the more the software engineer must know about the hardware. The objective of this course is to give software engineers an introduction to computer hardware. The material will be presented from a software engineer's point of view.

You will learn: To deal with hardware concepts at a level appropriate to your needs—To identify and become familiar with major hardware components such as: memory (primary, secondary, virtual and cache), the ALU, the control unit, buses, disk systems, tape systems, analog-to-digital converters and digital-to-analog converters, modems, concentrators, multiplexers, controllers—To lay out a high-level design of a simple computer hardware system—To evaluate simple and moderately complex logic.

Program Description

1. The logic of the computer.
Boolean algebra: AND, OR, NOT, XOR, truth tables, and logic equations. Logic components: the symbols (gates) for the Boolean functions and how they operate. Elementary devices: flip-flops, adders, counters, and registers are described. Synchronous and asynchronous logic are also discussed.

2. What makes a computer a computer?
Computer components: the five basic components of every computer. The arithmetic logical unit: the organization and implementation of the CPU component. The control unit: organization and operation of this unit; microcode and writeable control stole. Memory: core, semiconductor, RAM, ROM, PROM, and EPROM will be covered. Cache and virtual memory.

3. CPU organization and operation.
Bus structures and operation: three characteristics of buses. Timing, bandwidth, and bus protocol. Execution cycles: the three steps of an instruction execution cycle. Memory access: DMA, programmed I/O, and memory mapped I/O are compared. CPU example: An elementary CPU is constructed, using the previously presented examples.

4. Computer peripherals.
Disks: the principles of disk construction and operation. Winchester technology, IBM's 3380 disk drives, and thin film technology. Tape: all types of tape systems (e.g., open reel, cassette, and cartridge), as well as tape system operations, are reviewed. Terminals: both TTY and CRT types. RS/232, current loop interface, buffered I/O. Printers: various types of printer technology, including thermal, ink-jet, laser and COM.

5. Communications.
You are introduced to synchronous and asynchronous communications, serial and parallel communications, protocols, concentrators, and multiplexers. Simple networking techniques. Analog-digital: you will be given explanations of digital-to-analog converters and analog-to-digital converters.

6. Examples and comparisons of several current computer architectures.
DEC: PDP-11/44 and VAX 11/780. IBM: the 303X family. Intel: the 8080 and 8086. Plus other architectures.

7. Hardware trends.
Future: the "IBM 370 on-a-chip", Josephson junctions, and VLSI technology. State-of-the-art: Current state of the art in computer hardware is examined in detail.

About the Seminar Leader

Edward V. Berard.
An international consultant whose experience includes systems design and documentation, very large data bases, networking systems, code optimization, mathematical modeling, numerical analysis, computer graphics and computer science education—Clients have included General Motors, General Electric, General Dynamics, Bell and Howell, Control Data—Member, ACM, IEEE—B.S. in chemistry from University of Maryland; graduate work in quantum mechanics, advanced mathematics, numerical analysis, chemical physics at University of Maryland and University of Southern California.

Summer Institutes

Program No. 100.13

Program No. 100.14

The *Battelle Data Processing Summer Institutes* are specially created, intensive educational programs. The topics we choose for these Institutes are carefully selected to represent areas of current great importance and concern in the data processing field. These programs are designed for individuals with managerial or supervisory responsibility—individuals who already are on the move within their organizations or have growth aspirations. Because the programs are aimed at such people, the Institutes deal with concepts and methods for reducing costs, improving efficiencies, enhancing managerial capabilities.

The special nature of the *Summer Institutes* has led us to set them up in special environments—meeting facilities that are conducive to the highly involved experience you will have—relaxed, pleasant, comfortable settings.

Special Workshop on Cost-Effective Software Development

Because the effective management of software development is crucial to the success of every data processing operation, we have taken our two-day seminar, *Cost-Effective Software Development: The Life-Cycle Approach,* and are offering it also in a special five-day format as a *Summer Institute.* Featured in this *Institute* will be "hands on" experience in the use of life-cycles. Much of the time will be used for case study analysis and group workshops. Participants will formulate a System Development Life-Cycle derived from their case study work. The SDLC developed by each group will show the group perceptions of the way the various life-cycles interact.

Apart from the case studies and the workshop aspect of this *Summer Institute,* the content will be similar to the program detailed on page six. The workshop leader will also be Mr. Philip H. Teplitzky.

This *Summer Institute* will be offered in two locations: New York, Rye Town Hilton, July 27-31, No. 100.13 and Seattle, Battelle Conference Center, August 24-28, No. 100.14

For further information, please contact the Registrar. (See next page.)

Registration Information

Fees

The fee for each participant for the two-day seminars is $495 and includes all reference materials, handouts and luncheons. The fee does not include overnight accommodations.

Attendance Limitation

Attendance is limited to maximize good communications. *Please register early.* To register, or for more information, write or call the Registrar, Battelle Seminars and Studies Program, 4000 N.E. 41st Street, P.O. Box C-5395, Seattle, Washington 98105. Telephone, (206) 525-3130, or outside Washington state call toll free, 1-800-426-6762.

Accommodations

The Battelle Seminars and Studies Program has reserved a block of rooms at each meeting site. If you wish accommodations, please contact the site directly to reserve space. Be sure to indicate that you are attending a Battelle seminar.

Hours

Program hours are from 8:30 a.m. to 5:00 p.m. on the first day, and from 8:30 a.m. to 4:00 p.m. on the second day.

Reference Materials

Each participant will be provided with a full comprehensive workbook containing detailed information with lasting reference value.

CEUs

Because of the importance of continuing education, a nationally recognized credit system has been established. For each two-day seminar, you will receive 1.4 Continuing Education Units.

In-House Seminars

Most of these seminars, plus others, are available for presentation at your own facility for 15 or more people. *The benefits to your organization are:* lower cost per attendee; you choose the location; you choose the timing; you have greater freedom in discussing your own problems with the instructor. You may take advantage of this opportunity today by writing or calling the Registrar. (See registration form.)

Registration Form

Important: To speed your registration, enter three-digit priority code that appears on address label:

( ) ( ) ( )

Program name _____

Program no. _____

Program location _____ Program date _____

Name _____ Title _____

Name _____ Title _____

Organization _____

Address _____

City _____ State _____ Zip _____

Phone _____

☐ Check enclosed. (Make checks payable to Battelle.)

☐ Please bill me.

☐ Yes, I would like full details on your *Summer Institute.*

☐ Yes, I am interested in an in-house seminar on _____

_____ Please contact me.

Please return this registration form to, or call: the Registrar, Battelle Seminars and Studies Program, 4000 N.E. 41st Street, P.O. Box C-5395, Seattle, Washington 98105. Telephone, (206) 525-3130, or outside Washington state call toll free, 1-800-426-6762.

To help us plan future seminars for you, please check below subjects that are of interest to you.

☐ Methods of reporting/ displaying information
☐ EDP personnel productivity
☐ Structured techniques
☐ Computer graphics
☐ Effective writing for DP professionals
☐ Integrating word processing and data processing
☐ Office automation
☐ Other _____

Battelle Data Processing Seminar Schedule

Strategic Planning for Management Information Systems (No. 100.01)

Seattle	June 23-24	Greenwood Inn	(206) 455-9444
New York	July 22-23	Barbizon	(212) 247-7000
San Francisco	Aug. 20-21	Sir Francis Drake	(415) 392-7755
Washington D.C.	Sept. 14-15	Capital Hilton	(202) 393-1000
Houston	Oct. 21-22	Marriott West Loop	(713) 960-0111
Chicago	Nov. 12-13	Sheraton	(312) 787-2900
New York	Dec. 16-17	Barbizon	(212) 247-7000

Decision Support Systems (No. 100.02)

Boston	June 17-18	57 Plaza	(617) 482-1800
Seattle	Aug. 4-5	Battelle	(206) 525-3130
New York	Sept. 16-17	Barbizon	(212) 247-7000
Washington D.C.	Oct. 5-6	Shoreham	(202) 234-0700
Los Angeles	Nov. 4-5	Pacifica	(213) 649-1776
Dallas	Dec. 1-2	Sheraton	(214) 748-6211

Data Communications (No. 100.03)

Columbus	June 18-19	Hyatt	(614) 463-1234
New York	July 14-15	Barbizon	(212) 247-7000
Seattle	Aug. 11-12	Battelle	(206) 525-3130
Boston	Sept. 14-15	57 Plaza	(617) 482-1800
Los Angeles	Oct. 12-13	Pacifica	(213) 649-1776
New York	Nov. 16-17	Barbizon	(212) 247-7000
Houston	Dec. 7-8	Stouffers	(713) 629-1200

Cost-Effective Software Development (No. 100.04)

New York	May 20-21	Barbizon	(212) 247-7000
Seattle	June 11-12	Marriott	(206) 241-2000
Boston	Aug. 5-6	Copley Plaza	(617) 267-5300
Los Angeles	Sept. 24-25	Pacifica	(213) 649-1776
Chicago	Oct. 15-16	Sheraton Plaza	(312) 787-2900
Washington D.C.	Nov. 5-6	Marriott Key Bridge	(703) 524-6400
Atlanta	Dec. 3-4	Peachtree	(404) 659-1400

Distributed Data Processing (No. 100.05)

New York	June 9-10	Barbizon	(212) 247-7000
Washington D.C.	Sept. 16-17	Capital Hilton	(202) 393-1000
Los Angeles	Oct. 19-20	Pacifica	(213) 649-1776
New York	Nov. 17-18	Barbizon	(212) 247-7000
Seattle	Dec. 7-8	Marriott	(206) 241-2000

Data Base Systems (No. 100.06)

New Orleans	May 11-12	Monteleone	(504) 523-3341
Pittsburgh	June 15-16	William Penn	(412) 281-7100
New York	Sept. 14-15	Barbizon	(212) 247-7000
Boston	Oct. 5-6	Lenox	(617) 536-5300
Houston	Nov. 16-17	Adams Mark	(713) 978-7400

Data Base Technology (No. 100.07)

San Francisco	May 4-5	Sheraton-Palace	(415) 392-8600
New York	May 18-19	Biltmore	(212) 687-7000
Seattle	June 29-30	Marriott	(206) 241-2000
Boston	Sept. 14-15	57 Plaza	(617) 482-1800
New York	Nov. 16-17	Barbizon	(212) 247-7000
Chicago	Dec. 14-15	Continental Plaza	(312) 943-7200

Systems Development Project Management (No. 100.08)

Washington D.C.	June 18-19	Sheraton	(202) 328-2000
New York	Aug. 5-6	Barbizon	(212) 247-7000
Seattle	Sept. 14-15	Battelle	(206) 525-3130
Dallas	Oct. 22-23	Doubletree	(214) 691-8700
Boston	Nov. 17-18	Copley Plaza	(617) 267-5300
New York	Dec. 8-9	Barbizon	(212) 247-7000

Successful Management of EDP Operations (No. 100.09)

New York	June 16-17	Barbizon	(212) 247-7000
Chicago	Aug. 13-14	Stouffers	(312) 654-2800
Washington D.C.	Sept. 10-11	Capital Hilton	(202) 393-1000
Boston	Oct. 13-14	57 Plaza	(617) 482-1800
Seattle	Nov. 19-20	Marriott	(206) 241-2000
New York	Dec. 10-11	Barbizon	(212) 247-7000

Audit and Control (No. 100.10)

Boston	June 1-2	57 Plaza	(617) 482-1800
Washington D.C.	July 21-22	Marriott Key Bridge	(703) 524-6400
Seattle	Aug. 6-7	Battelle	(206) 525-3130
New York	Oct. 13-14	Barbizon	(212) 247-7000
Los Angeles	Dec. 3-4	Biltmore	(213) 624-1011

Estimating and Managing EDP Costs (No. 100.11)

Chicago	May 4-5	Marriott O'Hare	(312) 693-4444
Los Angeles	June 15-16	Marriott-Rey	(213) 822-8555
Houston	June 25-26	Adams Mark	(713) 978-7400
New York	Aug. 11-12	Barbizon	(212) 247-7000
San Francisco	Sept. 14-15	Sir Francis Drake	(415) 392-7755
Washington D.C.	Oct. 12-13	Capital Hilton	(202) 393-1000
Boston	Nov. 16-17	57 Plaza	(617) 482-1800
Dallas	Dec. 7-8	Sheraton	(214) 748-6211

Computer Hardware for Software Engineers (No. 100.12)

Seattle	May 14-15	Bellevue Hilton	(206) 455-3330
New York	June 22-23	Barbizon	(212) 247-7000
Washington D.C.	Aug. 10-11	Marriott Key Bridge	(703) 524-6400
Boston	Sept. 24-25	Continental Plaza	(617) 482-1800
New York	Oct. 22-23	Barbizon	(212) 247-7000
Chicago	Nov. 2-3	Rickies	(312) 943-7200
San Francisco	Nov. 30-Dec 1	57 Plaza	(415) 493-8000

Summer Institute (No. 100.13, 100.14)

New York (No. 100.13)	July 27-31	Rye Town Hilton	(914) 939-6300
Seattle (No. 100.14)	Aug. 24-28	Battelle	(206) 525-3130

Battelle
Seminars and Studies Program
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